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Modified Z-palatoplasty with one-layer closure in one-stage multilevel surgery for severe obstructive sleep apnea

Ethan I. Huang [a,b,c,*], Chia-Ling Kuo [d], Yu-Ting Chou [c,e], Yu-Ching Lin [b,c,e,f], Shu-Yi Huang [c,e,g]

[a] Department of Otolaryngology, Chang Gung Memorial Hospital, Chiayi, Taiwan
[b] School of Medicine, Chang Gung University, Taoyuan, Taiwan
[c] Sleep Center of Chang Gung Memorial Hospital, Chiayi, Taiwan
[d] Connecticut Institute for Clinical and Translational Science and Department of Community Medicine & Health Care, University of Connecticut Health Center, Farmington, United States
[e] Division of Pulmonary and Critical Care Medicine, Chang Gung Memorial Hospital, Chiayi, Taiwan
[f] Department of Respiratory Care, Chang Gung University of Science and Technology, Chiayi, Taiwan
[g] Department of Nursing, Chang-Gung University of Science and technology, Chiayi, Taiwan

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ABSTRACT

Objective: The meticulous two-layer closure is a step to complete the modified Z-palatoplasty, which has been reported to serve as an effective element in multilevel sleep surgery for patients with severe obstructive sleep apnea, especially with Friedman anatomical stages II and III diseases. A single layer closure—the suture closure as originally described in uvulopalatopharyngoplasty by Fujita et al., is an alternative of the two-layer closure, featured by simplicity while its efficacy has not been completely proved in patients with severe obstructive sleep apnea.
Methods: By apnea–hypopnea index (AHI), we investigated 7 patients with severe obstructive sleep apnea undergoing the modified Z-palatoplasty with one-layer closure in a multilevel surgery.
Results: The mean apnea–hypopnea index is reduced from 52.9 ± 17.1 (preoperative) to 18.4 ± 9.7 events/h (postoperative) without any wound dehiscence or bleeding that results in an unplanned return to the operating room. In comparison, the percentage of reduction in mean apnea–hypopnea index is 65%. The improvement of apnea–hypopnea index is statistically significant with the p-value 0.004.
Conclusion: Our results support that one-layer closure remains the efficacy of modified Z-palatoplasty (with two-layer closure) in one-stage multilevel surgery for severe obstructive sleep apnea with an unfavorable anatomical stage.

1. Introduction

Multilevel sleep surgery is usually needed for patients with severe obstructive sleep apnea (OSA) after unsuccessful or refusal of continuous positive airway pressure (CPAP) therapy [1,2]. It can be performed in single or multiple stages. In various multilevel surgeries, the modified Z-palatoplasty (ZPP) has been reported to serve as an effective element for severe OSA patients with Friedman anatomical stages II and III diseases [3–5]. These are poor candidates for traditional uvulopalatopharyngoplasty (UPPP).

* Corresponding author at: Department of Otolaryngology, 6 W. Sec. Jiapu Rd. Puzi, Chiayi 61363, Taiwan.
E-mail address: ehuang@alumni.pitt.edu (E.I. Huang).

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The modified ZPP creates two Z-plasty flaps for reconstruction with a precise and detailed 2-layer closure with an attempt to change scar contraction tension lines from the anterior-medial pull in the classic UPPP to an anterior-lateral direction [3,6]. The fundamental design of creating an anterior-lateral pull is thought to be the key that leads to a successful outcome. The surgery is completed by approximating the submucosal layer with 2–0 vicryl and closing the mucosal layer with 3–0 chromic structure [3,6,7]. To complete the meticulous closure, it requires to maintain the fundamental design of anterior-lateral pull, keep the original intention of minimizing mucosal tension, and prevent a major suture dehiscence of the relatively longer flap. The suture dehiscence may cause a free-swinging end that needs repair in the operation room over secondary healing. These steps are time-consuming and labor-intensive, and a potential solution is to perform ZPP with a single layer closure—the suture closure as originally described in UPPP by Fujita et al. [8] and other modifiers.

In this study, we evaluate the surgical outcome of modified ZPP with one-layer closure, as an element of one-stage multilevel surgery for severe OSA patients, by apnea–hypopnea index (AHI).

2. Materials and methods

This study was approved by the authors' Institutional Review Board. From January 2014 to April 2016, severe OSA patients who met the following criteria were enrolled to the study:

- Age $\geq$ 20 years
- Unsuccessful or refusal of CPAP
- AHI $>$ 30 events/h
- Body mass index (BMI) $<$ 35 kg/m^2
- Received a one-stage multi-level sleep surgery with the modified ZPP performed with one-layer closure

Each patient received preoperative endoscopic evaluation, preoperative and postoperative polysomnography (PSG) to determine the anatomical stage and AHI. Epworth Sleepiness Scale (ESS) that includes 8 4-point scale (0–3) questions was used to measure daytime sleepiness with the total score ranging from 0 to 24. The higher the ESS score, the higher that person's daytime sleepiness in daily life. An 11-point visual analog scale (VAS) was used to assess the intensity of pain with the score ranging from 0 (no pain) to 10 (worst pain) on the first and 7th days after the surgery. No intravenous or oral narcotics was prescribed to prevent respiratory depression. Intravenous Dynastat twice daily was prescribed for 1–3 days. The procedure of one-layer closure is illustrated in Fig. 1. Initial steps were carried out in the same manner as advised by Friedman and Hwang [3], including performing bilateral tonsillectomy, marking the palatal flap incision (Fig. 1a), removing the anterior mucosa of the palatal flap (Fig. 1b), and

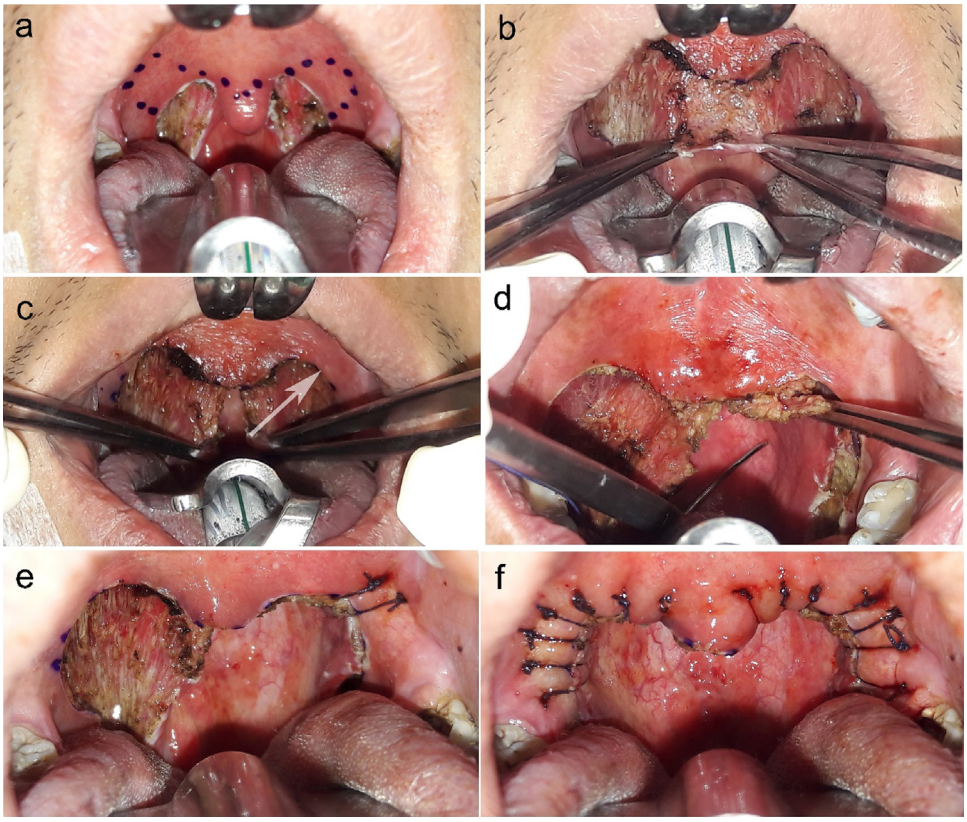

Fig. 1. (a) Bilateral tonsillectomy is performed. The incision for palatal flaps is marked. (b) The anterior mucosa of the palatal flap and distal tip of uvula are removed. (c) The uvula and palate are split in midline. The arrow indicates the suture match point of the split uvula (arrow end) and the soft palate (arrow head). (d) The needle is held to pass through soft palate from the back to the front in one whole layer. (e) The uvular flap is reflected laterally and closed with 2–0 vicryl. (f) Completion of the suture. The photo in (d) is from another patient for illustration.

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